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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/247,816	02/09/1999	ANGUS DORBIE	20545.0006(1	8083

7590 01/16/2004

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EXAMINER
CAO, HUEDUNG X

ART UNIT	PAPER NUMBER
2671	

DATE MAILED: 01/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)	
Office Action Summary	09/247,816	DORBIE, ANGUS	
	Examiner	Art Unit	
	Huedung X Cao	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *12 September 2003*.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-18* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-16 and 18* is/are rejected.

7) ☐ Claim(s) *17* is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.

4) ☐ Interview Summary (PTO-413) Paper No(s). _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1, 4, 6, 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Grossman (#6,246,415 B1) in view of Duluk, Jr. (#5,596,686).

As per claim 1 Grossman teaches a method for culling occluded objects from an

image being rendered into a frame buffer, the method, performed by host processor,

comprising:

constructing a coarse Z-buffer, the coarse Z-buffer subdivide into a series of tiles,

each tile having an associated depth value (Grossman, col. 4, lines 1-13; col. 6, lines

11-33). It is noted that Grossman does not explicitly disclose the coarse Z-buffer

subdivide into a series of tiles; however, Grossman's computer display being divided

into a plurality of tiles suggests the same idea of dividing the Z-buffer into a series of

tiles. Furthermore Duluk teaches that the step of dividing Z-buffer into a series of tile is

widely used in the art (Duluk, col. 35, lines 11-19; col. 99, lines 15-25). Thus, it would

have been obvious to one of ordinary skill in the art to combine Duluk's teaching into

Grossman system by culling occluded objects to improve the efficiency of the video graphics.

updating the depth values of the coarse Z-buffer using Z information from the frame buffer (Grossman, step 406, figure 4); and

using the depth values to selectively discard the occluded objects from the image being rendered (Grossman, figure 5).

As per claim 4: the step of using the depth values to selectively discard the occluded objects further comprises:

constructing a surrogate volume for an object (Grossman, col. 2, lines 22-25);and

comparing nearest Z-values of the surrogate volume to the depth value of a tile that includes the surrogate volume (Grossman, col. 2, lines 22-36).

As per claim 6 is similar to claim 4 and adding the step of retrieving the greatest depth value from the set of tiles that are spanned by the surrogate volume (Grossman, col. 2, lines 3-10).

Claim 12 claims a system based on a method of claim 1; therefore, they are rejected for the same reson.

Claim 13 claims a machine readable medium based on a method of claim 1; therefore, they are rejected for the same reason.

3.   Claims 2-3, 5, 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grossman (#6,246,415 B1) in view of Duluk, Jr. (#5,596,686) and further in view of Ouaknine et al. (#6,091,422).

As per claim 2: updating depth values is performed synchronously as information in the frame buffer changes (Ouaknine, col. 7, lines 34-64). It would have been obvious to one of ordinary skill in the art at the time the invention was made by synchronously updating depth values in order to discard occluded objects of the image.

As per claim 3: updating the depth values is performed asynchronously (Ouaknine, col. 5, lines 32-40). It is also noted that the depth data updating synchronously or asynchronously with the change of fame buffer information depends just on the application and speed of process.

As per claim 5 and similar claim 7: a method in claim 4 further comprise the step of transforming the surrogate volume from object space to eye space (Ouaknine, figures 7a-7c).

As per claim 8: constructing a lower resolution coarse Z-buffer, the lower resolution coarse Z-buffer subdivide into a series of tiles, each tile having an associated depth value; and updating the depth values of the lower resolution coarse Z-buffer using Z information from the frame buffer (Ouaknine, col. 8, lines 48-50).

As per claim 9: each tile in the lower resolution coarse Z-buffer covers the same screen area as each tile in the coarse Z-buffer (Ouaknine, col. 8, lines 48-64).

As per claim 10: the tiles in the lower resolution coarse Z-buffer are overlapping (Ouaknine, abstract).

4.   Claims 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Green et al. (#6,480,205), hereinafter Green.

As per claim 14, and a similar claim 18, Green teaches a method for early culling

of occluded objects, comprising:

ordering all objects, the objects being included in an image being rendered,

according to their distance from eye point (Green, column 10, lines 1-7);

logically dividing area of the image into a coarse z-buffer, the coarse Z-buffer

including a series of tiles, the tiles being arranged in a rectangular grid, wherein the grid

may have different resolutions, and wherein each tiles has an associated depth value,

the depth value being a Z-buffer value farthest from the eye that is included within that

tile (Green, column 7, line 44 to column 8, line 29);

constructing a surrogate volume for each object of the image, wherein each

surrogate volume is a three-dimensional object that is just large enough to contain the

object being ordered and wherein each surrogate volume may span only one tile of an

appropriate resolution (Green, column 10, lines 49-54);

determining a depth value of the surrogate volume that is nearest to eye of a

viewer (Green, column 11, lines 19-22);

determine depth value of the one tile that includes the surrogate volume (Green,

column 11, lines 44-47);

comparing the depth value of the surrogate volume versus the depth value of the

tile including the surrogate volume (Green, column 11, line 60 to column 12, line 12);

culling the objects whose surrogate volume has a depth value farther from the eye than the depth value of the tile, including the surrogate volume, after a single comparison (Green, column 12, lines 12-67);

rendering the objects whose surrogate volume has depth value closer to the eye with the depth value of the tiles including the surrogate volume (column 13, lines 24-34), it is noted that Green does not disclose rendering the objects whose surrogate volume has depth value <u>equidistant</u> to the eye with the depth value of the tile including the surrogate volume; however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include this feature to make the system for efficient since it would have eliminated the time process for rendering the objects.

As per claim 15: wherein a surrogate volume may span several tiles and further comprising: comparing the depth value of the surrogate volume with each of the spanning tiles (column 13, line 38-56); culling the objects whose surrogate volume has a depth value father from the eye than the depth value of the tiles including the surrogate volume (column 13, line 57 to column 14, line 25); rendering the objects whose surrogate volume has a depth values closer to the eye than the depth value of at least one of the tiles (column 14, lines 26-42). It is noted that Green does not disclose rendering the objects whose surrogate volume has depth value <u>equidistant</u> to the eye with the depth value of the tile including the surrogate volume; however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include this feature to make the system for efficient since it would have eliminated the time process for rendering the objects.

As per claim 16: subdividing the objects that are not occluded into smaller objects; determining if the smaller objects are occluded (Green, column 12, lines 5-12).

5.   Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over KAUFMAN et al. (#6,674,430).

As per claim 11, Kaufman teaches the claimed "system, used as a host for a graphics pipeline" (Kaufman, figure 4) comprising:

A host processor executing a graphics application program (Kaufman, host 32);

A generation stage for creation, acquisition, and modification of information (Kaufman, column 8, lines 9-16);

A traversal stage for traversal of application data structures and passing on appropriate graphics data (Kaufman, column 8, lines 18-34);

A graphic processor (Kaufman, column 8, lines 35-60);

A transformation stage (Kaufman, column 14, lines 8-38);

A rasterization stage (Kaufman, figure 5, column 9, lines 21-34);

A feedback loop (Kaufman, figure 4); and

A display stage for scanning resulting pixels in frame buffer for display to a display device (Kaufman, figure 30).

It would have been obvious to a person of ordinary skill in the art that Kaufman's set of geometry and CUBE-5 pipelines can perform the claimed functions of "transformation data from object space coordinates into eye-space coordinates, performing requested lighting operation, clipping the transformed data in clip space, and

projecting resulting coordinates into window-space" because the standard pipeline processors (Kaufman, figure 32) are designed to perform the basic geometry processing such as perspective projection, lighting/shading objects to enhance the quality of displayed object.

Allowable Subject Matter

6.   Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Inquires

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to **Huedung Cao** whose telephone number is

(703) 308-5024.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, **Mark Zimmerman,** can be reached at **(703) 305-9798**.

Any response to this action should be mailed to:

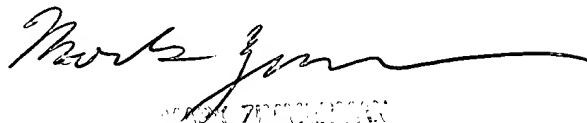Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal

Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the Technology Center 2600 Customer Service Office

whose telephone number is (703) 305-0377.

Huedung Cao
Patent Examiner